

**PCT**WORLD INTELLECTUAL PROPERTY ORGANIZATION  
International Bureau

## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

<b>(51) International Patent Classification 6 :</b> <b>B65B 55/02</b>	<b>A1</b>	<b>(11) International Publication Number:</b> <b>WO 96/18541</b> <b>(43) International Publication Date:</b> 20 June 1996 (20.06.96)
<b>(21) International Application Number:</b> PCT/US95/16460 <b>(22) International Filing Date:</b> 12 December 1995 (12.12.95) <b>(30) Priority Data:</b> 6/331420 12 December 1994 (12.12.94) JP <b>(71) Applicant (for all designated States except US):</b> THE COCA-COLA COMPANY [US/US]; 310 N. Avenue, Atlanta, GA 30313 (US). <b>(72) Inventors; and</b> <b>(75) Inventors/Applicants (for US only):</b> KITAHORA, Nobuya [JP/JP]; 2016-13, Honmachida, Machida-shi, Tokyo 194 (JP). AOYAGI, Osamu [JP/JP]; 5-15-15, Seishin, Sagamihara-shi, Kanagawa 229 (JP). <b>(74) Agents:</b> BIRCH, Anthony, L. et al.; Birch, Stewart, Kolasch & Birch L.L.P., P.O. Box 747, Falls Church, VA 22040-0747 (US).		<b>(81) Designated States:</b> AM, AT, AU, BB, BG, BR, BY, CA, CH, CN, CZ, DE, DK, EE, ES, FI, GB, GE, HU, IS, JP, KE, KG, KP, KR, KZ, LK, LR, LT, LU, LV, MD, MG, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, TJ, TM, TT, UA, UG, US, UZ, VN, European patent (AT, BE, CH, DE, DK, ES, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG), ARIPO patent (KE, LS, MW, SD, SZ, UG).  <b>Published</b> <i>With international search report.</i> <i>Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.</i>
<b>(54) Title:</b> SYSTEM AND METHOD FOR STERILE PACKAGING OF BEVERAGES  <b>(57) Abstract</b>  A system and method for sterile packaging of beverages in plastic containers form the plastic containers and fill them with sterile beverages in a common sterile environment. The containers are formed from a blow molding process in which the containers reach elevated temperatures sufficient to at least impart sterilize the interior of the containers, are filled with sterile beverages immediately after the containers are formed in the same sterile environment. This eliminates the need for heavy use of sterilizing fluids for the plastic containers such as hydrogen peroxide or the like.		

**FOR THE PURPOSES OF INFORMATION ONLY**

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

AT	Austria	GB	United Kingdom	MR	Mauritania
AU	Australia	GE	Georgia	MW	Malawi
BB	Barbados	GN	Guinea	NE	Niger
BE	Belgium	GR	Greece	NL	Netherlands
BF	Burkina Faso	HU	Hungary	NO	Norway
BG	Bulgaria	IE	Ireland	NZ	New Zealand
BJ	Benin	IT	Italy	PL	Poland
BR	Brazil	JP	Japan	PT	Portugal
BY	Belarus	KE	Kenya	RO	Romania
CA	Canada	KG	Kyrgyzstan	RU	Russian Federation
CF	Central African Republic	KP	Democratic People's Republic of Korea	SD	Sudan
CG	Congo	KR	Republic of Korea	SE	Sweden
CH	Switzerland	KZ	Kazakhstan	SI	Slovenia
CI	Côte d'Ivoire	LJ	Liechtenstein	SK	Slovakia
CM	Cameroon	LK	Sri Lanka	SN	Senegal
CN	China	LU	Luxembourg	TD	Chad
CS	Czechoslovakia	LV	Latvia	TG	Togo
CZ	Czech Republic	MC	Monaco	TJ	Tajikistan
DE	Germany	MD	Republic of Moldova	TT	Trinidad and Tobago
DK	Denmark	MG	Madagascar	UA	Ukraine
ES	Spain	ML	Mali	US	United States of America
FI	Finland	MN	Mongolia	UZ	Uzbekistan
FR	France			VN	Viet Nam
GA	Gabon				

**SYSTEM AND METHOD FOR STERILE  
PACKAGING OF BEVERAGES**

**BACKGROUND OF THE INVENTION**

The present invention relates to a method and system for sterile packaging of beverages. More specifically, the invention relates to a beverage  
5 packaging system and method for filling sterile beverages in plastic containers while forming the container in a sterile environment.

At present, plastic containers such as PET bottles are widely used as the containers for  
10 packaging beverages such as coffee drinks, teas, colas or juices. When a beverage is filled in these plastic containers, such beverages are sterilized in accordance with a UHT (ultra high temperature) sterilization treatment or the like and then, are  
15 filled in the sterilized plastic container, and the containers are sealed with sterilized caps.

Hitherto, plastic containers have been produced in separate bottle manufacturing plants and beverages have been filled in plastic containers in separate  
20 filling plants (bottlers) different from the bottle manufacturing plant. Accordingly, plastic containers are usually exposed to the open air from the time when these containers have been produced in any bottle manufacturing plant until the time when they have been  
25 transported to any filling plant, where the beverages have been filled. Thus, it was necessary to treat the

- 2 -

plastic containers for sterilization after container manufacture and prior to filling the beverage in the plastic container.

Known methods for sterilizing plastic containers  
5 utilize hydrogen peroxide or an aqueous mixture of hydrogen peroxide. In case of the sterilization with hydrogen peroxide it is necessary to minimize residual amounts of hydrogen peroxide in the plastic containers. This involves technical problems and long  
10 periods of time must be taken for washing after sterilization.

#### SUMMARY OF THE INVENTION

An object of the present invention is to provide a beverage packaging system or method enabling one to  
15 omit any sterilization treatment of plastic containers at the time of filling beverages or to significantly curtail this sterilization treatment.

According to the present invention, the objects are fulfilled by providing a beverage packaging system  
20 comprising a resin supplier unit, a preform molding machine for molding a preform, a blow molding machine for molding a container by inflating the preform, a beverage supply source for supplying a sterilized beverage, a cap supplier unit, a cap sterilizer unit  
25 for sterilizing the cap supplied from the cap supplier unit, a filler unit for filling the sterilized beverage supplied from the beverage supply source in a plastic container molded by means of the blow molding machine and a cap clamping unit for sealing  
30 the plastic container filled with the beverage by means of the filler unit with the sterilized cap supplied from the cap sterilizer unit, said packaging system being characterized in that said blow molding machine, filler unit, cap sterilizer unit and cap

- 3 -

clamping unit are arranged within a sterile chamber.

Further scope of applicability of the present invention will become apparent from the detailed description given hereinafter. However, it should be understood that the detailed description and specific examples, while indicating preferred embodiments of the invention, are given by way of illustration only, since various changes and modifications within the spirit and scope of the invention will become apparent to those skilled in the art from this detailed description.

#### BRIEF DESCRIPTION OF THE DRAWINGS

The present invention will become more fully understood from the detailed description given hereinbelow and the accompanying drawings which are given by way of illustration only, and thus, are not limitative of the present invention and wherein:

The sole Figure 1 is a block diagram illustrating the preferred embodiment of the beverage sterilization and packaging system of the present invention.

#### DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

The beverage packaging system and method according to the present invention will be explained by referring to Figure 1. In this working example, there is used PET (polyethylene terephthalate) as the container material. However, other plastic materials such as polyethylene naphthalate, polypropylene, polyethylene, polycarbonate, nylon, etc. can be also used.

In this beverage packaging system, PET material is supplied to a preform molding machine 12 from a resin supplier unit 10. The preform molding machine 12 works to form a test tube-shaped preform, for

- 4 -

example, in accordance with an injection molding method, an extrusion molding method, etc. In the case of using PET, the temperature at which the preform is molded is in a range of 260°-280°C, for instance.

5 Accordingly, the interior of the molded preform is inherently in a state of being heat sterilized.

The molded preform is fed to a blow molding machine 14 and pressurized air is supplied into the preform whereby the preform is inflated to form a

10 plastic container. In the case of using PET, the temperature of the container immediately after blow molding is in a range of 50°-95°C, for instance. Where any other plastic material has been used, there are some cases where the temperature of the container

15 immediately after blow molding is somewhat higher than the above temperature range.

In this working example the preform molding machine 12 and the blow molding machine 14 are constructed as distinct units arranged by connecting

20 them directly. Instead, such construction is possible that the preform molding machine 12 and the blow molding machine 14 are arranged separately and a preform molded by means of the preform molding machine 12 is transported to the blow molding machine 14

25 through any known means.

Preferably, the preform molding machine 12 and the blow molding machine 14 are constructed as distinct units arranged by connecting them directly, as above. More preferably, these units are

30 constructed with an integral molding machine such as an injection blow molding machine or extrusion blow molding machine. For instance, where using the injection blow molding machine, the preform molding is conducted by using a neck mold, a core mold and a

35 cavity mold and the blow molding is performed by using

- 5 -

the neck mold and the blow mold both employed in the preform molding.

PET bottles molded as above are supplied to a filler unit 16.

5       Beverages are supplied to a beverage sterilizer unit 20 from a beverage supply unit 18 for supplying beverages such as coffee drinks, teas, colas or juices. And these beverages are subjected to a UHT sterilization treatment, for example.

10       In this working example the sterilized beverages are supplied to the filler unit 16 from a beverage supply source constructed with the beverage supply unit 18 and the beverage sterilizer unit 20. Then these beverages are filled in the PET bottles molded  
15 as above and the filled bottles are supplied to a cap clamping unit 22.

Caps which are constructed with a metal sheet and plastics or the like as in the conventional caps are supplied to a cap sterilizer 26 from a cap supply unit

20       24. For instance, these caps are treated for sterilization with sterilization and then are supplied to the cap clamping unit 22. In the cap clamping unit 22 the caps treated for sterilization are clamped on the PET bottles filled with beverages.

25       The PET bottles which are sealed with caps as in the conventional bottles are supplied to a feed unit 28. In this feed unit 28 the PET bottles are labelled and each bottle is housed in a casing, for instance. After being subjected to any necessary treatment like  
30 sampling inspection, the bottles are transported to consumers.

According to the present invention, the blow molding machine 14, filler unit 16, cap sterilizer unit 26 and cap clamping unit 22 are arranged within  
35 a sterile chamber 30.

- 6 -

Where the temperature at the time of the blow molding conducted in the blow molding machine 14 is relatively high, the inside of the container is inherently heat sterilized. This enables one to fill  
5 beverages in containers molded through the molding machine 14 by using these containers as such.

On the other hand, where the temperature at the time of the blow molding in the molding machine 14 is relatively low or in the case of beverages which  
10 require any especially high sterilization treatment, a container sterilizer unit and a washing unit or the like are installed between the blow molding machine 14 and the filler unit 16. Also in this case, the interior of a plastic container is put in a high-  
15 temperature state in the blow molding machine 14, in consequence of which the sterilization treatment can be fairly reduced, compared with a conventional example in which the container molding and the beverage filling are conducted separately.  
20 Accordingly, it is possible to significantly reduce an amount of any agent used at the time of the plastic container sterilization. This enables one to drastically reduce the plastic container sterilization cost. Moreover, since the sterilization treatment can  
25 be curtailed in this way, it is possible to make an arrangement of space of the whole filler unit fairly small.

Further, the temperature of a container immediately after its molding by means of the blow  
30 molding machine 14 is in a range of 50°-95°C, for instance. In the case of installing any container sterilizer unit, since the blow molding machine 14 and the container sterilizer unit are so arranged as to be adjacent, a high-temperature container immediately  
35 after its being molded by means of the blow molding



- 7 -

machine 14 is to be supplied to the sterilizer unit. Therefore, when the container has been sterilization treated with an agent like hydrogen peroxide, the container is mostly heated at high temperature in order to enhance a sterilization effect. However, it becomes unnecessary to dispose any means for heating the container by arranging the blow molding machine 14 and the container sterilizer in an adjacent manner, as above.

10 In the preferred embodiment of the present invention, the preform molding machine 12, blow molding machine 14, filler unit 16, cap sterilizer unit 26 and cap clamping unit 22 are arranged within the sterile chamber 30.

15 As above, in the preform molding machine 12, a plastic material is treated at fairly high temperatures thereby to form a preform. Accordingly, the preform is put in a state of being heat sterilized. Even if this has been treated by means of the blow molding machine 14, the interior of its formed container is maintained in a sterilized state. Accordingly, beverages can be filled by means of the filler unit 16 without any necessity to additionally sterilization treat the container supplied from the blow molding machine 14.

Naturally, with various temperature conditions or necessary sterilization conditions taken into consideration a sterilizer unit, a washing unit, etc. are installed between the blow molding machine 14 and the filler unit 16, for example. However, as above, the preform molding machine 12, blow molding machine 14, filler unit 16, etc. are arranged within the sterile chamber 30. This enables one to substantially curtail the sterilization treatment.

35 Further, the sterile-state grade or level of the

- 8 -

sterile chamber 30 is selected by considering the beverages to be filled, container production step, etc. Moreover, it is possible to construct this sterile chamber 30 with plural portions having  
5 different grades or levels. For instance, the preform molding machine 12 and/or the blow molding machine 14, etc. can be constructed with a sterile chamber (a so-called clean room) having a relatively low grade and any other portion can be constructed with a sterile  
10 chamber having a high grade.

The invention being thus described, it will be obvious that the same may be varied in many ways. Such variations are not to be regarded as a departure from the spirit and scope of the invention, and all  
15 such modifications as would be obvious to one skilled in the art are intended to be included within the scope of the following claims.

- 9 -

What is claimed is:

1 1. A beverage packaging system comprising a resin  
2 supplier unit, a preform molding machine for molding  
3 a preform, a blow molding machine for molding a  
4 container by inflating the preform, a beverage supply  
5 source for supplying a sterilized beverage, a cap  
6 supplier unit, a cap sterilizer unit for sterilizing  
7 the caps supplied from the cap supplier unit, a filler  
8 unit for filling the sterilized beverage supplied from  
9 the beverage supply part in a plastic container molded  
10 by means of the blow molding machine and a cap  
11 clamping unit for sealing the plastic container filled  
12 with the beverage by means of the filler unit with the  
13 sterilized cap supplied from the cap sterilizer unit,  
14 said packaging device being characterized in that said  
15 blow molding machine, filler unit, cap sterilizer unit  
16 and cap clamping unit are arranged within a sterile  
17 chamber.

1 2. The beverage packaging device according to claim  
2 1 wherein said preform molding machine is also  
3 arranged within the sterile chamber.

1 3. The beverage packaging device according to claim  
2 2 wherein said preform molding machine and blow  
3 molding machine are constructed as an integral  
4 injection blow molding machine.

- 10 -

1 4. The beverage packaging device according to claim  
2 2 wherein said preform molding machine and blow  
3 molding machine are constructed as an integral  
4 extrusion blow molding machine.

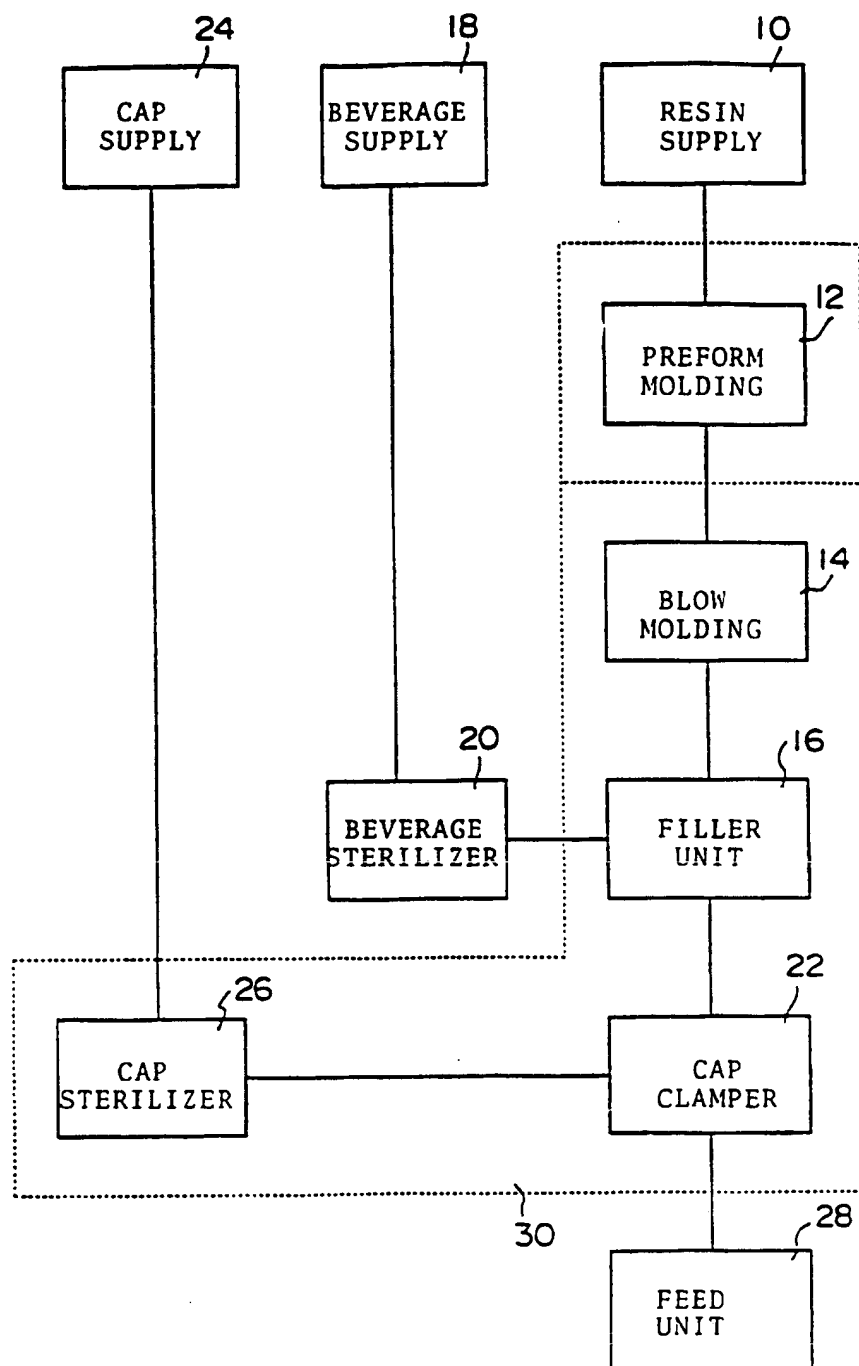
1 5. A method of sterile packaging of beverages  
2 comprising the steps of:  
3 providing a sterile environment;  
4 forming a container within the sterile  
5 environment;  
6 providing a source of sterile beverage;  
7 filling the container with the sterile beverage  
8 immediately after forming the container in the sterile  
9 environment; and  
10 sealing the container so filled while in the  
11 sterile environment.

1 6. The method of claim 5 wherein the container is  
2 formed by a blow molding process.

1 7. The method of claim 6 wherein the blow molding  
2 process heats the container to a sufficient  
3 temperature to at least partially sterilize the  
4 interior of the container.

1 8. The method of claim 5 wherein the sterile  
2 environment includes a chamber with different  
3 portions, each portion having a different grade of  
4 sterile criteria therein.

1/1



# INTERNATIONAL SEARCH REPORT

International Application No

PCT/US 95/16460

## A. CLASSIFICATION OF SUBJECT MATTER

IPC 6 B65B55/02

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 6 B65B B67C

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US,A,4 208 852 (PIOCH) 24 June 1980 see the whole document ---	1,5-7
Y	GB,A,2 263 472 (STALPEX) 28 July 1993 see page 5, line 10 - page 6, line 18; figure 1 ---	1,6
Y	US,A,4 590 734 (UEDA) 27 May 1986 see abstract; figure 1 -----	1,6 5

☐ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

### \* Special categories of cited documents:

- \*A\* document defining the general state of the art which is not considered to be of particular relevance
- \*E\* earlier document but published on or after the international filing date
- \*L\* document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- \*O\* document referring to an oral disclosure, use, exhibition or other means
- \*P\* document published prior to the international filing date but later than the priority date claimed

\*T\* later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

\*X\* document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

\*Y\* document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

\*A\* document member of the same patent family

Date of the actual completion of the international search

11 April 1996

Date of mailing of the international search report

24.04.96

Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2  
NL - 2280 HV Rijswijk  
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,  
Fax: (+31-70) 340-3016

Authorized officer

Claeys, H

# INTERNATIONAL SEARCH REPORT

Information on patent family members

Int. Patent Application No

PCT/US 95/16460

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US-A-4208852	24-06-80	FR-A- 2290352	04-06-76
		BE-A- 835391	07-05-76
		CH-A- 592546	31-10-77
		DE-A- 2548035	20-05-76
		GB-A- 1522654	23-08-78
		LU-A- 73753	11-06-76
		NL-A- 7513012	11-05-76
		SE-A- 7512372	10-05-76
-----			
GB-A-2263472	28-07-93	BE-A- 1003744	02-06-92
-----			
US-A-4590734	27-05-86	NONE	
-----			